GBBC
Global Blockchain
Business Council

STANDALONE REPORT

GLOBAL STANDARDS MAPPING INITIATIVE 5.0
DECEMBER 2024

INDIA COUNTRY SPOTLIGHT

GBBC GSMI 5.0

CONTRIBUTORS:

1. Jayesh Ranjan, IAS: Special Chief Secretary for Information Technology, Electronics & Communications (ITE&C) and Industries & Commerce Departments of Government of Telangana.
2. Lakshmi Eswari, Senior Director & Centre Head, Centre For Development of Advanced Computing (C-DAC)
3. Sukriti Govil, Consultant, Emerging Technologies Wing, ITE&C Department, Government of Telangana
4. Ragini Laskar, Consultant (YCP-Auctus), ITE&C Department, Government of Telangana
5. Anil Kakani, VP & India Country Head, Algorand Foundation
6. Nikhil Varma, Technical Lead – India, Algorand Foundation
7. Aishwary Gupta, Global Head of Payment, Polygon Labs
8. Kamakshi Arjun, BD Lead India - Enterprises & Institutions, Ava Labs
9. J. Siv Ram Shastri, Co-Founder, Hyderabad DAO
10. G. Rohan Reddy, Co-Founder, Hyderabad DAO
11. Diana Barrero Zalles, Head of Research and Sustainability, Global Blockchain Business Council
12. Rama Devi Lanka, Director of Emerging Technologies Wing, Officer on Special Duty, Information and Technology Department, Government of Telangana, India

INDIA COUNTRY SPOTLIGHT

1. EVOLUTION OF BLOCKCHAIN IN INDIA

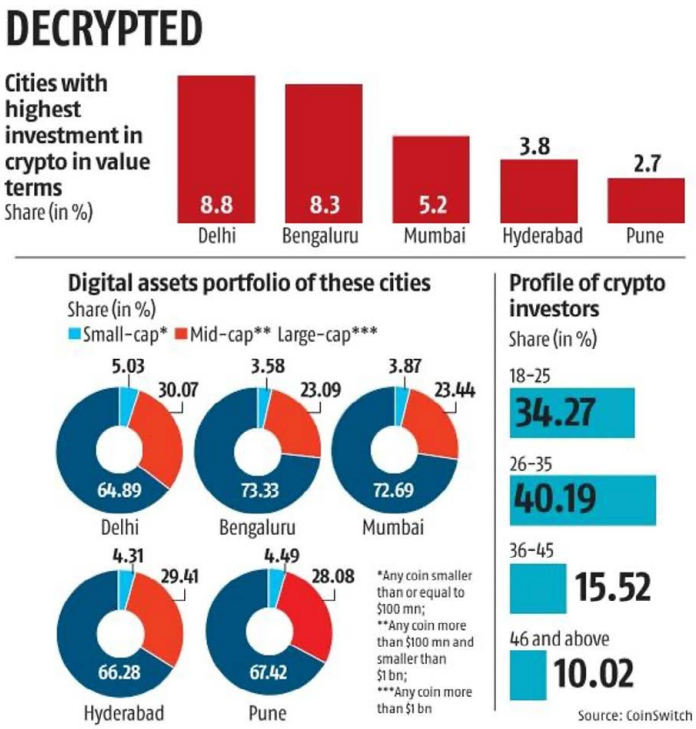
1.1. Market Overview and Key Milestones in Blockchain Adoption[1]

India is poised to emerge as a global leader in blockchain and Web3 technologies, driven by rapid adoption and a thriving startup ecosystem. According to a white paper unveiled at the 'Entrepreneur Web3 Summit' in Bengaluru, the Indian blockchain market is projected to grow from $0.28 billion in 2019 to $4.3 billion by 2025, reflecting a staggering compound annual growth rate (CAGR) of 47.3%. This growth is fueled by applications across financial services, supply chain management, and government initiatives. Notably, India is home to 1,203 blockchain-based financial startups, including prominent players like Hike, CoinDCX, CoinSwitch, IndiGG, and Vauld. International funds have already invested over $500 million in the Indian start-up and blockchain ecosystem

The momentum extends to the broader Web3 space, which is expected to grow from $0.0049 billion in 2022 to $1.1 billion by 2032, at an impressive CAGR of 57%. India's adoption of cutting-edge technologies such as decentralized finance (DeFi) and non-fungible tokens (NFTs) mirrors this trajectory. The NFT market alone is projected to expand from $3.3 billion in 2021 to $27 billion by 2028, with a CAGR of 61.6%. Additionally, India ranks first among 151 countries in the 2024 Global Crypto Adoption Index by Chainalysis, highlighting its leadership in digital assets. The digital assets market is further expected to grow by 6.58% annually from 2024 to 2028, reaching a volume of $726.2 million. With approximately 450 Web3 startups among 8,700 globally, India's ecosystem is evolving rapidly, signaling significant opportunities for innovation and economic transformation in the coming years.

India's cryptocurrency landscape is marked by a vibrant and youthful investor base. According to a report by cryptocurrency exchange platform CoinSwitch, the country boasts over 19 million cryptocurrency investors, with nearly 9% of them being women. The majority of these investors, approximately 75%, fall within the 18 to 35 age group, reflecting the strong interest among younger demographics.

In 2023, Dogecoin emerged as the most popular cryptocurrency in India, accounting for 11% of the total invested value in the crypto market, followed by bitcoin at 8.5% and Ethereum at 6.4%, showcasing the diverse preferences of Indian investors.



1.1.1. Timeline and Development Phases[2]

Early Stage
India's initial engagement with blockchain technology was marked by increasing Bitcoin awareness, laying the foundation for broader exploration. Companies like Unocoin and Zebpay pioneered cryptocurrency exchanges, showcasing blockchain's transformative potential. Financial applications gained momentum with initiatives such as BankChain and research efforts by the Institute for Development and Research in Banking Technology (IDRBT), focusing on banking innovations. Meanwhile, the Reserve Bank of India (RBI) maintained a cautious but keen interest, acknowledging blockchain's prospects while carefully monitoring its development within the financial sector.

Growth and Adoption
India's blockchain journey reflects significant strides in innovation, collaboration, and regulatory foresight. Initial efforts saw blockchain-based land registry systems piloted in Panchkula and trade finance solutions tested in diverse settings. NITI Aayog, the government's policy think tank, played a pivotal role in exploring blockchain's potential for public governance through pilot initiatives.

Entrepreneurial activity surged with startups like Polygon and WazirX, while increased banking engagement and the establishment of the Hyperledger India Chapter fostered collaboration. Indian projects gained global recognition, especially in areas of DeFi and NFTs, along with witnessing increasing participation from corporations such as TCS and Infosys integrating blockchain into their operations. Reserve Bank of India also initiated pilot projects for a Central Bank Digital Currency (CBDC).

Enhanced cooperation between educational institutions and blockchain enterprises is fostering innovation and skilled talent development. A few examples include:

- TimesPro, in collaboration with IIT Delhi, iHub Divyasampark (IIT Roorkee), and the India Blockchain Alliance, has developed cutting-edge courses on Web 3.0 technologies like blockchain, cryptocurrencies, and NFTs. These programs aim to provide modern, interactive learning experiences with certifications issued by participating IITs.
- AlgoBharat initiative by the Algorand Foundation, has to date (2024) onboarded over 60 universities across India to integrate Algorand-based curricula and projects.
- Kalp Decentra Foundation (KALP) and the Birla Institute of Management Technology (BIMTECH) have signed a Memorandum of Understanding (MoU) to establish a Blockchain Learning Centre at BIMTECH's campus.

These initiatives highlight the growing integration of blockchain technology into Indian academia, preparing a new generation of technologists well-versed in advanced blockchain systems.

Policymakers have demonstrated a concerted effort towards creating a supportive regulatory environment for blockchain technologies, aiming for a balance between innovation and consumer protection. For instance, the Government of India has launched the National Blockchain Framework (2024), to foster research and application development. The Government of Telangana released a draft Blockchain Policy outlining the framework of the blockchain ecosystem in 2019, which aimed at creating an ecosystem for promoting research, innovation and industry collaboration. Hosted in collaboration with NITI Aayog, the Governments of Telangana and Goa, in addition to Nucleus Vision, the first International Blockchain Congress was aimed at bringing thought-provoking conversations on blockchain for next-generation services, developing blockchain applications, blockchain technologies for government, and putting in place regulations and guidelines. The dialogue between blockchain enterprises and regulatory bodies continues to evolve, reflecting the government's intent to harness the benefits of blockchain while remaining focused on mitigating potential risks.

1.1.2. Future Projections and Trends[3]

- Regulatory Evolution: As the government refines its approach to blockchain technologies, clear regulations are anticipated to emerge, which could further fuel the market's growth.
- Technological Advancements: Continued innovation in blockchain could lead to more efficient systems, lower costs, and new applications in sectors like healthcare, education and agriculture.
- Programs like the first-ever Web3 Startup Lab at T-Hub, sponsored by the Algorand Foundation, focus on supporting accelerating blockchain innovation across different verticals and increasing access to the necessary tools for founders to take their solutions to market.
- The PwC India Blockchain Lab in Kolkata, established in 2017, drives innovation by integrating advanced blockchain solutions. It helps organizations harness the potential of distributed ledger technology to foster growth and embrace disruptive advancements.
- Investment Inflow: With regulatory clarity and continued growth, both domestic and international investors appear eager to increase their participation, supporting the expansion of the blockchain ecosystem in India.
- Community & Talent Pool: Increasingly more courses and training resources are being deployed to support blockchain ecosystem growth.

1.2. Cryptocurrency in India: A Tale of Ambivalence

India presents a fascinating dichotomy when it comes to cryptocurrency. Millions of Indians actively trade and invest in digital currencies, driven by the promise of innovation and high returns, fueling a burgeoning crypto community. It is driven by a dynamic ecosystem led by exchanges like WazirX, CoinDCX, and CoinSwitch, which have democratized access to cryptocurrencies and influenced regulatory discussions through active policymaker engagement. This success has spurred a surge in crypto investments and inspired a wave of startups exploring blockchain applications in DeFi, NFTs, smart contracts, and tokenization, supported by a tech-savvy user base eager to embrace innovative financial solutions. Venture capital inflows are fueling this growth, with investors recognizing the potential of India's large, digitally connected population.

However, regulatory bodies are cautiously crafting policies to address concerns like market volatility, consumer protection, and potential misuse, striving to balance innovation with security. Practical challenges, such as inadequate infrastructure and hesitant traditional financial institutions, limit everyday use, confining cryptocurrencies to investments. Yet, with a vibrant entrepreneurial ecosystem and evolving regulations, cryptocurrencies are poised to transition from speculative assets to integral financial tools.

2. NATIONAL INITIATIVES AND GOVERNMENT FLAGSHIPS

2.1. Integrating Blockchain Technology into National Strategy[4]

The National Strategy on Blockchain Technology, unveiled by the Ministry of Electronics and Information Technology (MeitY) in 2021, marks a significant commitment by the Indian government to integrate blockchain technology into its digital infrastructure. This strategy is not merely about adopting new technology but is aimed at transforming public services through enhanced transparency, security, and efficiency.

MeitY aims to advance blockchain adoption across sectors by focusing on creating a robust ecosystem through fostering research & development, establishing a clear regulatory framework, and enhancing capacity building. The national strategy seeks to integrate blockchain into public services and governance, positioning India as a global leader in blockchain technology.

The strategy emphasizes robust research and development (R&D) to address key challenges in blockchain technology, including scalability, interoperability, security, and privacy. It prioritizes designing scalable consensus mechanisms, improving transaction throughput and smart contract security. Furthermore, capacity building is a core component of the national strategy. The government is investing in education and training programs to prepare the workforce for the upcoming technological shifts. This includes specialized courses in blockchain technology and its applications, aimed at both new students and existing professionals.

2.2. National Blockchain Framework[5]

MeitY, envisioning a future of trusted digital platforms, has launched the National Blockchain Framework (NBF) to foster research and application development. The initiative aims to enable transparent, secure, and reliable digital service delivery to citizens, aligning with the Government

of India's commitment to leveraging cutting-edge technology for public benefit. It seeks to position India as a global leader in blockchain technology while encouraging the proliferation of developed solutions for global adoption.

The research focuses on improving security, privacy, and performance. Key advancements include the implementation of Zero-Knowledge Proofs (ZKP), Attribute-Based Encryption (ABE), indigenous Certification Authorities (CA), and Software Security Modules (SSM). Other efforts involve enhancing smart contract security, developing security audit checklists, and optimizing performance through parallel smart contracts and scalable protocols. Interoperability across blockchain applications is also a priority, ensuring seamless integration and robust fault tolerance.

2.2.1. Vishvasya-Blockchain Technology Stack[6]

The Vishvasya Blockchain Technology Stack is designed to provide Blockchain-as-a-Service (BaaS) through a geographically distributed infrastructure, supporting various permissioned blockchain applications. By fostering trust through innovative distributed software architectures, it enables consensus on shared states and establishes a single source of truth. The BaaS model ensures robust security across blockchain components while addressing adoption challenges faced by stakeholders such as infrastructure providers, smart contract developers, and application developers. Vishvasya's key features include rapid end-to-end development and deployment of permissioned blockchain applications, ready-to-use, security-audited Blockchain containers for production setups, and blockchain-specific security audit guidelines and best practices. The geographically distributed infrastructure spans across three data centers at Hyderabad, Pune, and Bhubaneswar. This innovative platform is the result of collaborative efforts by the Centre For Development of Advanced Computing (C-DAC), the National Informatics Centre (NIC), the Institute for Development and Research in Banking Technology (IDRBT) Hyderabad, the Indian Institute of Technology (IIT) Hyderabad, the International Institute of Information Technology (IIIT) Hyderabad, and the Society for Electronic Transactions and Security (SETS) Chennai, developed with support from MeitY.

2.2.2. NBFLite[7]

NBFLite is a blockchain sandbox platform, specifically designed to support startups and academia in rapid application prototyping, research, and capacity building.

2.2.3. Praamaanik[8]

In the ever-evolving digital landscape, ensuring the security of mobile devices from malicious applications and counterfeit customer support has become critical to protecting personal data and preventing financial losses. Praamaanik, powered by the National Blockchain Framework, addresses this challenge by leveraging blockchain technology to verify the authenticity of mobile applications. Through this system, designated representatives upload mobile apps, and their unique details are securely recorded in a blockchain ledger, creating an immutable record. Citizens can authenticate mobile apps seamlessly using the M-Kavach 2 mobile security application, ensuring trust and safety.

The platform offers several key features that enhance its utility and impact. These include maintaining a tamper-proof ledger of mobile app fingerprints, providing a single source of truth for

app authenticity, and delivering a robust solution to combat counterfeit and malicious applications. Additionally, Praamaanik fosters user confidence with its streamlined process for recording app fingerprints, ensuring ease of use, and simplifying access to genuine customer support services.

2.2.4. National Blockchain Portal[9]

The National Blockchain Portal has been designed as a comprehensive resource hub to support the National Blockchain Framework initiative. Built on a robust Content Management System, the portal offers a wealth of information, including the latest blockchain news, articles, success stories, events, conferences, and updates on education and training. This centralized platform keeps users informed about emerging blockchain trends and advancements, fostering awareness and collaboration within the ecosystem.

The portal's coverage spans a wide array of topics, including success stories, technical resources, national and international events, workshops, conferences, and a curated list of blockchain startups. It also provides access to education and training materials, along with publications and patents, ensuring users stay informed and engaged with the latest developments in blockchain technology.

The platform is further enhanced by several key features designed to improve user experience and participation. An integrated AI-powered chatbot offers quick answers to queries, while a crowdsourcing option allows users to contribute content. Managed content roles—such as "User," "Reviewer," and "Admin"—ensure the portal remains dynamic and well-maintained. Additionally, a subscription feature enables users to receive regular updates, keeping them connected with the latest portal content. By combining rich resources with interactive features, the National Blockchain Portal serves as a vital tool for India's blockchain ecosystem.

2.3. Central Bank Digital Currency (CBDC) Pilot Launch by RBI[10]

The Reserve Bank of India (RBI) launched a pilot project for the Central Bank Digital Currency (CBDC) in 2022. The digital rupee is intended to enhance payment efficiency, reduce transaction costs, and improve financial inclusion while maintaining the stability of the traditional banking system.

The pilot was launched for a CBDC in both Wholesale and Retail segments. The Wholesale pilot, termed the Digital Rupee - Wholesale (e₹-W), was introduced on November 1, 2022, with its primary use case being the settlement of secondary market transactions in government securities. This initiative aims to enhance the efficiency of the inter-bank market by reducing transaction costs and eliminating the need for settlement guarantee infrastructure or collateral to mitigate risks. The Retail pilot, called the Digital Rupee - Retail (e₹-R), was launched on December 1, 2022, within a closed user group comprising selected customers and merchants.

The e₹-R, a digital token representing legal tender, is issued in denominations equivalent to physical currency and distributed through banks. Users can transact via digital wallets provided by participating banks, enabling Person-to-Person (P2P) and Person-to-Merchant (P2M) transactions. Like cash, the e₹-R ensures trust, safety, and settlement finality, but does not earn interest and is convertible to other forms of money. Initially, the retail pilot involves eight banks in phases: State Bank of India, ICICI Bank, Yes Bank, and IDFC First Bank in the first phase, followed by Bank of Baroda, Union Bank of India, HDFC Bank, and Kotak Mahindra Bank. The RBI plans to gradually expand the scope of these pilots to include more banks, users, and locations based on the feedback received.

As of June 2024, both retail and wholesale CBDCs (e₹-R & e₹-W) in India have witnessed a number of customers rising to 5 million, from 1.3 million a year earlier, and the number of merchants increasing to 420,000 from 300,000.

2.4. Centre of Excellence in Blockchain Technology[11]

The National Informatics Centre (NIC), established in 1976 under MeitY, serves as the technology partner of the Government of India, providing ICT and eGovernance support to Central and State Governments. To advance blockchain adoption, NIC has established a Centre of Excellence in Blockchain Technology (CoE-BCT), envisioned as a coordinated, interoperable ecosystem for fostering blockchain innovation. The CoE aims to enhance understanding and implementation of blockchain technologies, offering a platform to develop, test, and deploy innovative solutions for government projects. By collaborating with global experts, the CoE will lead the development of blockchain systems from proof of concept to production, driving research-led initiatives to address complex governance challenges and improve service delivery. Additionally, the CoE seeks to promote blockchain adoption across public and private sectors, ensuring solutions meet modern technological standards in a secure and trustworthy manner. By leveraging blockchain's potential for trust, transparency, and efficiency, NIC aims to foster transformative applications that enhance government operations and citizen engagement, emphasizing evidence-based solutions to ensure cost-effectiveness and service improvement. The NIC launched a new website to highlight its blockchain initiatives, which hosts up to 7.93 million documents.

2.5. India's Call for Global Collaboration: The G20 Story[12]

At the G20 Summit, India advocated for a global framework on cryptocurrencies to address their transformative potential and associated risks. A key highlight was the call for swift implementation of the Crypto-Asset Reporting Framework (CARF), which standardizes tax reporting for crypto transactions and ensures automatic information exchange between jurisdictions. This will enhance transparency and prevent concealment of crypto transactions, including those involving foreign exchanges.

2.6. Regulatory mandates

2.6.1. Regulatory Measures for Curbing Spam with Blockchain Integration[13]

The Telecom Regulatory Authority of India (Trai) has urged MeitY to take decisive action against the rising wave of spam and phishing communications occurring on over-the-top (OTT) apps like WhatsApp and Telegram. While Trai and the Department of Telecommunications (DoT) have been implementing measures to curb spam calls and messages that often facilitate financial fraud, OTT platforms fall under MeitY's regulatory purview, creating a gap in oversight for these newer communication channels.

In a recent meeting of the joint committee of regulators, Trai officials emphasized the need for MeitY to address this issue collaboratively. Trai has already implemented measures such as a blockchain-based distributed ledger technology (DLT) platform for telecom operators to manage and regulate commercial traffic effectively. However, this solution does not extend to OTT communication channels, leaving them outside its scope of enforcement.

To strengthen protections against spam, Trai recently directed telecom operators to block messages containing unverified URLs, OTT links, APKs (Android application packages), or call-back numbers starting October 1. Entities like banks and e-commerce platforms must whitelist their information with telecom operators, who then integrate it into their DLT systems. Only messages that match this registered data are allowed to pass through, ensuring an additional layer of security for users. Trai continues to advocate for a joint regulatory framework to comprehensively address spam across both traditional and digital communication platforms.

2.6.2. Anti-money laundering (AML) provisions[14]

India has introduced anti-money laundering (AML) measures targeting cryptocurrency platforms and virtual digital asset (VDA) transactions to enhance financial transparency, curb criminal activities, and prevent terrorist financing. These provisions bring cryptocurrency trading, safekeeping, and related financial services under the ambit of the Prevention of Money Laundering Act (PMLA), 2002, marking a significant step in regulating the digital asset sector.

The federal government issued a gazette notification mandating intermediaries dealing with VDAs, including crypto exchanges, to implement robust "know your customer" (KYC) protocols for all users. These entities, now classified as "reporting entities" under PMLA, must also notify the Financial Intelligence Unit India (FIU-IND) of any suspicious activities. Additionally, they are required to maintain detailed records of all transactions, especially those involving cash amounts exceeding INR 1 million (US$12,191), for at least five years. Transactions closely related within a month that cumulatively exceed this threshold must also be documented.

The directive specifies that various VDA-related transactions are now subject to PMLA compliance. These include exchanges between VDAs and fiat currencies, transactions between different VDAs, VDA transfers, safekeeping or administration of VDAs, and financial services related to the issuance and sale of VDAs. This comprehensive approach underscores India's commitment to fostering a transparent and secure digital asset ecosystem.

3. UNLOCKING THE POTENTIAL: USE CASES OF BLOCKCHAIN TECHNOLOGY ACROSS INDIA

3.1. Blockchain-based Solutions[15]

A variety of blockchain-based solutions have been developed or are currently under development in collaboration with prominent government organizations in India. These include the Security Printing & Minting Corporation of India Limited, Cotton Corporation of India Limited, Forensic Science Laboratory, Sardar Vallabhbhai Patel National Police Academy, Central Board of Secondary Education, Ministry of Justice, Ministry of Consumer Affairs, and the Unique Identification Authority of India. In addition, partnerships with state governments such as Karnataka, Puducherry, Andhra Pradesh, Chhattisgarh, Assam, Telangana, and Jammu & Kashmir aim to create and deploy innovative blockchain applications across various domains.

Key blockchain applications being implemented include e-Stamp solutions, judiciary-focused applications, service-level training record management for IPS officers, and forensic systems. Other notable projects encompass Praamaanik for verifying mobile app authenticity, consent management frameworks, IoT device security, cotton bale identification and tracking, and several document

management solutions such as domicile certificate chains, caste certificates, property chains, and education certificate chains. Furthermore, initiatives like agricultural produce tracking and inspection systems for childcare institutions are enhancing transparency and efficiency in critical sectors.

3.2. State-Driven Initiatives

Several Indian states are actively leveraging blockchain technology to modernize governance and public service delivery. This adoption underscores a widespread recognition of blockchain's capabilities to foster transparency, enhance security, and streamline operations across various sectors of governance.

3.2.1. Tamil Nadu: Nambikkai Inaiyam's Digital Identity and Service Delivery[16]

Tamil Nadu Nambikkai Inaiyam is a state-wide blockchain infrastructure project launched by the Tamil Nadu government in 2023. The project aims to create a secure and transparent platform for government services, enabling efficient and fraud-resilient workflows. Key features of Nambikkai Inaiyam include the use of blockchain technology to secure and verify government documents, such as land records, academic certificates, and e-Sevai certificates. This platform is expected to benefit citizens by providing them with easy access to government services and ensuring the authenticity of official documents.

3.2.2. Maharashtra and Karnataka: Digitizing Land Records[17]

These states are at the forefront of using blockchain to digitize land records. The primary objective is to ensure greater transparency in land transactions and prevent common frauds associated with land sales and ownership disputes. The blockchain ledger provides an immutable record of land titles, making it nearly impossible to tamper with data.

- **Problem:** Land records in these states have long been plagued by issues of transparency and security. Traditional paper-based systems are prone to errors, fraud, and corruption. This leads to disputes, delays in property transactions, and overall inefficiency in the land administration process.
- **Solution:** Blockchain technology offers a robust solution to these challenges. By digitizing land records onto an immutable, decentralized ledger, it ensures transparency, security, and efficiency in land transactions.

Karnataka's Bhoomi Project: It has successfully digitized over 120 million land records. This initiative has reduced land disputes by 70% and boosted land revenue collection by 20%. By integrating blockchain technology, the project ensures transparency, security, and immutability of land records, while smart contracts automate processes like land registration and mutation, further enhancing efficiency and trust in the system.

Maharashtra's Land Records Modernization Project: The key focus of the initiative is to streamline land registration, mutation, and property tax collection, leading to a significant reduction in fraudulent land transactions and faster property registration processes. By leveraging blockchain technology, the system creates tamper-proof digital records of land ownership, enabling real-time tracking of land transactions[18]

3.2.3. Punjab: Transforming Agricultural Supply Chains[19]

The focus here is on revolutionizing agricultural supply chains. Blockchain technology helps in tracking the provenance of agricultural products, ensuring fair pricing mechanisms, and improving the overall efficiency of the supply chain. For farmers, this means better access to markets and a more transparent system of pricing their produce.

- **Problem:** The agricultural supply chains in these states face numerous challenges, including lack of transparency, inefficient logistics, and unfair pricing. Farmers often struggle to get fair prices for their produce due to intermediaries and information asymmetry.
- **Solution:** Blockchain technology can revolutionize agricultural supply chains by providing greater traceability, transparency, and efficiency.

Punjab's Agricultural Reforms: This initiative focuses on enabling direct farmer-to-consumer sales by reducing the role of middlemen, resulting in fairer pricing for farmers, improved quality control, and reduced food wastage. By leveraging blockchain technology, it establishes a decentralized platform where farmers can sell their produce directly to consumers. Smart contracts automate payments and ensure timely settlements, enhancing trust and efficiency in the agricultural supply chain.

3.2.4. Rajasthan and Uttar Pradesh: Streamlining Government Services[20]

These regions are adopting blockchain for a broader spectrum of applications. Projects include blockchain for enhancing citizen services, streamlining healthcare and educational offerings, and improving the efficiency of tax collection systems. These initiatives are designed to simplify interactions between the citizens and the government, reducing bureaucratic inefficiencies, and ensuring a higher degree of data integrity.

- **Problem**: These states face challenges in delivering efficient and transparent government services. Bureaucratic hurdles, corruption, and lack of digital infrastructure hinder the delivery of essential services to citizens.
- **Solution:** Blockchain technology can streamline government processes, enhance citizen services, and improve governance.

Uttar Pradesh: The Uttar Pradesh government has approved 109 research projects worth Rs 140 million to utilize AI and blockchain technology for various applications. These include early cancer detection, posture correction systems, assistive technology for the disabled, and renewable energy solutions. The government aims to leverage these technologies to address pressing societal issues and drive innovation in the state.

Rajasthan's Electronic Health Records (EHR) on Blockchain: This project has enhanced patient privacy, with secure data sharing and streamlined healthcare delivery. Blockchain integration ensures data integrity, transparency, and auditability of health records.

The state-specific initiatives described above demonstrate a growing recognition of blockchain's potential to improve transparency, security, and efficiency in government operations. By implementing blockchain solutions across various sectors, these states are working towards creating a more transparent, accountable, and citizen-centric governance ecosystem. Among these, the state of Telangana leads the way in blockchain adoption and in building the blockchain ecosystem.

3.3. Telangana: A Blockchain Pioneer

"India's blockchain journey is a testament to our commitment to innovation and technological leadership. The nation's rapid adoption of blockchain across governance, finance, and enterprise solutions demonstrates our potential to set global standards in building secure, efficient, and transparent ecosystems." – Jayesh Ranjan, Special Chief Secretary, ITE&C Department, Government of Telangana

Telangana is particularly noteworthy, leading the way, not only in blockchain adoption but also in fostering a supportive ecosystem for blockchain innovation. The Telangana government is committed to the adoption of blockchain technology. Telangana's Emerging Technologies Wing has been at the forefront of blockchain innovation, promoting transparency, trust, and efficiency across various sectors. The government's blockchain initiatives have the potential to transform several sectors, including government, finance, supply chain, and healthcare.

The state has formulated a policy framework based on four main pillars: to develop a talent pool supporting infrastructure, to promote research and innovation, to enable collaboration, and to build a robust web3 community. The state conceptualized the Blockchain District, aimed to create the world's best blockchain technology ecosystem, in collaboration with the Government of Telangana, C-DAC, Industry (Tech Mahindra), and Academia (IIIT-Hyderabad).

The state also set up a blockchain accelerator called T-Block Accelerator in partnership with the industry - Tech Mahindra. It is a four-month-long accelerator program for blockchain startups. T-Block selects promising blockchain startups, providing them with mentorship, technical support, and networking opportunities to accelerate their growth.

This provides a controlled environment for Web3 use cases to navigate the regulatory space in India. This initiative comprises 17 partnerships between Government bodies, Industries, Regulators, Lawyers, Investors, and Academia. The potential shortlisted Web3 startups were in the field of sustainable finance, digital asset trading, DeFi (Agriculture & Micro, Small & Medium Enterprises - MSMEs), SocialFi & Tokenization. This initiative also identifies the roadblocks faced by startups to establish themselves in India within the regularity space, in addition to providing recommendations for legal and regulatory modifications to Indian regulations/policies.

The Telangana government is at the forefront of India's blockchain revolution, publishing a Technical Guidance Note on Asset Tokenization. It provides a comprehensive recommendation for stakeholders to navigate this emerging domain, fostering innovation and growth in the blockchain ecosystem.

The Government of Telangana has successfully implemented over 12 blockchain pilot projects across various departments, showcasing diverse use cases. Key implementations include securing educational certificates, tracking and traceability for agricultural goods like gunny bags and seeds, First Information Report (FIR) management in police records, vehicle life cycle management (VLM) at the Regional Transport Office, and blockchain-based property registration systems. Another notable initiative, StreeNidhi, leverages blockchain to build credit histories and provide credit ratings

for Self-Help Groups. Future projects in collaboration with departments such as Energy and Gram Panchayats aim to develop blockchain-based systems for carbon credit trading, while the Excise and Police Departments plan to enhance tracking and traceability in the liquor supply chain and distillery products. These initiatives highlight Telangana's commitment to leveraging blockchain for transparency, efficiency, and innovation.

3.3.1. Telangana State Blockchain Framework

"In Telangana, we have embraced blockchain as a cornerstone of our digital transformation strategy. By fostering collaboration between the government, industry, and startups, we are creating a vibrant ecosystem that drives impactful solutions and establishes the state as a leader in emerging technologies." – Ramadevi Lanka, Director Emerging Technologies Wing, ITE&C Department, Government of Telangana

Implementing blockchain technology in public services often involves complex processes and the collaboration of multiple stakeholders. The government in consultation with the industry, is working towards making Hyderabad the Web3 hub of India. Taking a giant leap in this direction, the Government of Telangana has conceptualized India's first Blockchain District. This one of its kind initiative will aim to put all blockchain companies based out of Hyderabad in a strategically advantageous position globally. While the **Blockchain District** acts as an anchor around which the blockchain ecosystem will develop, the **Telangana State Blockchain Framework** sets the strategic direction and is based on four main pillars:

1. **Developing Talent Pool:** The Telangana State Blockchain Framework fosters a skilled workforce by collaborating with industry and academia to provide blockchain education and training programs. It also supports research, innovation, and infrastructure development to create a conducive environment for blockchain adoption. Additionally, it promotes collaboration and community building to drive blockchain adoption across various sectors.
2. **Supporting Infrastructure:** To foster blockchain innovation and adoption, the Telangana State Blockchain Framework will provide shared infrastructure and resources. This includes subsidized office space for startups, international collaboration to attract investment and knowledge exchange, a sandbox environment for testing blockchain solutions, and cloud computing services to enable Blockchain-as-a-Service offerings.
3. **Promoting Research & Innovation:** The Telangana State Blockchain Framework aims to foster innovation and research in blockchain technology by encouraging collaborations between industry and academia, attracting global talent, funding research programs, supporting startups through incubators and accelerators, and organizing events to facilitate knowledge sharing.
4. **Enabling Collaboration and Building Community:** The Telangana State Blockchain Framework aims to foster collaboration and community building by raising awareness, supporting developer communities, showcasing local successes globally, creating online platforms for networking, joining industry organizations, organizing events, and providing mentorship and support to startups.

3.3.2. T-Chits

T- Chits introduce a blockchain-based system for administering chit funds, a saving and borrowing instrument akin to mutual funds, in the state. The solution helps in preventing fraud in the system and protects retail customers who may be more vulnerable to scams. T-Chit's success is such that it is finding takers of its technology in neighboring states like Tamil Nadu, Karnataka and Andhra Pradesh. *Since its rollout, the Hyderabad-based startup has had a massive impact: it has facilitated savings of over $2.1 billion and more than 1 million subscribers per annum in the State alone.*

Context: "Chit", a traditional yet unique financial instrument, which combines both saving and borrowing option in a single transaction, has become a household name in southern India for ages. Many SMEs from lower and middle-income groups have chosen Chit Funds for their capital and saving needs.

Problem: Both the central and state governments regulate Chit Funds. These entities have an enormous task of managing a huge number of transactions, in addition to enforcement involving loads of paperwork being exchanged between parties. For Chit Fund companies, often plagued by brand image, many unregistered businesses have been sprouting. For subscribers, in a distributed economy, a Chit Fund can play a key role as a complement to other financial instruments/services provided both from the government (SME loans, Free education, Health, etc.) and private financial entities like Banks, non-banking financial companies (NBFCs), and Insurance companies.

Solution: There is a need to enable this quasi-banking industry and rebuild trust into the system, not just by digitizing current processes but also by leveraging next generation technologies. T-Chits have enabled all the application processes, reporting activities and many other operations on a cryptographically secure, permissioned, distributed ledger, smart contract based blockchain.
Tech Stack:

- UI Framework: Angular 4, HTML5, CSS 3.0, PWA, JavaScript
- J2EE framework: Spring Boot, Hibernate, JPA, Flowable BPM
- Database: MySQL, Mongo DB, Couch DB Blockchain IBM Hyperledger Fabric
- Browsers supported: Chrome (for POC)
- Cloud: AWS (Amazon Web Services)

3.3.3. E-Voting

Telangana with C-DAC, conducted India's first smartphone-based e-voting pilot in the Khammam district. The project utilized blockchain to secure votes, ensuring transparency and preventing tampering. It aimed to enhance voter accessibility and explore the potential of technology in elections. Some of the important issues that are addressed while implementing remote e-Voting are as follow:

a. Correct Voter Identification

- **Problem:** Prevent proxy voting and ensure only eligible voters to cast ballots
- **Solution:** Utilize Real-Time Digital Authentication of Identity (RTDAI)
- **RTDAI Features:**
    - o Liveness detection: verifies a real person took the selfie (not a photo)

    - o Demographic matching: compares facial features in the selfie with the voter's Electors Photo Identification Card (EPIC) photo
    - o Deep learning-based image comparison: identifies discrepancies between photos even with significant changes
- **Benefits**: Proven success in Telangana's Pensioner Life Certificate program with high accuracy

b. Voter Registration

- **Challenge**: Streamline registration for remote e-Voting
- **Solution:** Mobile app registration with user information and selfie submission.
- **Registration Steps:**
    1. Enter name, voter ID, and upload a selfie
    2. Liveness detection and photo matching with EPIC card details occur
    3. Upon successful verification, a transaction ID is sent via SMS and email
- **Expected Success Rate:** 90-95% of voters based on past experience
- **Alternatives for Non-Registered Voters:**
    - o Traditional EVM voting at polling stations
    - o Online or in-person resubmission of details at government centers
- **Security Measures:**
    - o Phone number and International Mobile Equipment Identity (IMEI) number used for registration are tagged to the voter ID
    - o Voting allowed only from the registered mobile phone
    - o One phone can't be used for more than two registrations to prevent proxy voting

c. Server Redundancy

- **Challenge:** Ensure system availability and data integrity in case of server failure.
- **Solution:** Dual server setup in active-active mode
- **Server Locations:**
    - o One set in Ministry of Urban Affairs & Development (MAUD)
    - o Another set in the State Data Centre (SDC)
- **Benefits:**
    - o Every transaction gets recorded in both locations
    - o Enhanced redundancy and data protection

d. Leveraging Existing Expertise

- **Challenge:** Identify qualified entities to develop and implement the solution
- **Solution:** Collaborate with experienced providers and researchers
    - o Potential Partners: National Securities Depository Limited (NSDL) – Indian central securities depository, K-Fintech, Right2Vote.in (e-voting experience), IITs (research expertise), startups specializing in blockchain, encryption, and data security
    - o Crucial Requirement: Enhance data security protocols of existing solutions to meet stringent e-Voting standards

Tech Stack:

- o **AI and Machine Learning:** For liveness detection, biometric matching, and demographic verification

- **Blockchain:** For immutable record-keeping and transparency
- **Encryption:** For secure data transmission and storage
- **Cybersecurity Tools:** For protecting the system from cyberattacks
- **Mobile App Development:** For a user-friendly interface for voter registration and voting
- **Server Infrastructure:** For hosting the e-voting platform and ensuring high availability

3.3.4. Seed Traceability

Telangana is indeed at the forefront of utilizing blockchain for seed traceability. To prevent disbursement of spurious seeds in the agricultural value chain, a blockchain based seed traceability solution was implemented. This initiative aims to enhance transparency, prevent adulteration, and ensure the quality of seeds distributed to farmers.

Process Cycle: The solution involves tracking the journey of seeds from the producer to the farmer. Growers provide verified data about seed production, which is recorded digitally using QR codes. Seeds are then packed and containerized with QR-mapped information, and the distributor onboards them into their inventory management system. Distributors scan for GRN (Goods Received Note) and sell to retailers, who receive SMS notifications upon sale. Farmers can scan the QR code on the seed packet to view the seed's quality, source, and origin, with SMS notifications provided in the local language for better accessibility. This traceability solution ensures transparency and accountability in the seed supply chain, allowing farmers to make informed decisions and trust the quality of the seeds they purchase.

Deployment Landscape: The solution involves two private Seed Production Companies (SPCs) and one government SPC, with approximately 300 seed-producing farmers. The system has enabled the traceability of over 250 metric tons of seeds across two major crops, paddy and cotton. The solution has been implemented across 4 distributors and 9 retailers, reaching approximately 200 seed-buying farmers. This traceability initiative ensures transparency and accountability in the seed supply chain, benefiting all stakeholders from producers to farmers.

Impact:

- **Seed Producing Farmers and Aggregators:**
  - Benefit from managing farm activities and detailed farm mapping
  - Can track the seed journey from sowing to harvest, adhering to the package of practices
- **Seed Producing Companies:**
  - Achieve (Stock keeping Unit) SKU-level traceability with QR codes, enabling better inventory management and efficient production and processing
  - Benefit from an integrated supply chain approach
- **Distributors and Retailers:**
  - Implement container and SKU-level tracking
  - Improve inventory management and operational efficiency
- **Crop Producing Farmers:**
  - Reduce distress and save lives by ensuring the quality and source of seeds
  - Improve productivity by tracing the seed journey

3.3.5. Stree Nidhi

Stree Nidhi in Telangana State is playing a great role in alleviating poverty and helping to enhance the financial status of poor women who are part of Self-Help Groups (SHG), with timely and

affordable credits. Over the years, Stree Nidhi has created a niche in the sphere of microfinance with its low-cost credit delivery. The success of Stree Nidhi Telangana in delivery of low-cost funds to borrowers in need has already attracted national attention and is being implemented in several states across the country. PoST is a Blockchain-based solution to empower poor women, especially the unbanked and underbanked population. *The Loan disbursement and repayments of StreeNidhi for all the 150,000 members will be recorded on a blockchain platform. The Pilot phase will include 150,000 SHG members of the Rajanna District of Telangana.*

Problem: Stree Nidhi's system faced several challenges, both technical and functional. Technically, the system lacked data security, was highly dependent on vendors, lacked transparency, and had high maintenance costs and inadequate performance. Functionally, the system relied heavily on manual work for accountancy, depended on bank loans, and lacked member-level information, including credit history. This hindered the ability to incentivize or disincentivize members based on their financial behavior.

Solution: Stree Nidhi now has an enhanced system for their operational needs, developed based on blockchain technology, which ensures greater transparency, enhanced data security, increased efficiency, and reduced maintenance costs. This system helped Stree Nidhi to significantly reduce operational expenses, while enabling SHG members to leverage their credit history to access other financial products like micro-insurance from external providers.

Tech Stack

- Ethereum Blockchain
- Dharma Protocol
- Java
- ReactJS

3.3.6. Telangana Web3 Regulatory Sandbox[22]

The advent of Web 3.0, powered by blockchain technology, is ushering in a new era of decentralized internet, empowering users and shifting focus from centralized entities. However, the emerging regulatory landscape poses challenges for firms and consumers operating in this space. To address this, the Government of Telangana launched a Web 3.0 Regulatory Sandbox. This initiative aims to create a conducive environment for Web 3.0 startups in India, not only to encourage them to operate within the country but also to assist them in navigating the complex regulatory terrain. By providing a controlled environment for testing innovative products, the Sandbox seeks to foster innovation while ensuring consumer protection and regulatory compliance.

The Execution team is comprised of a Governing Council and an Operations team. The Governing Council is responsible for making the executive level decisions for running the sandbox. The members of the Governing Council have representation from the State government, industry experts, lawyers, academia, VC firms, and other domain experts.

The first cohort of the Sandbox includes eight startups working on sustainable finance, digital asset trading, DeFi for agriculture, DeFi for MSMEs, Social-Fi, real estate tokenization, and media IP registration. The State has Studied regulations, laws, and licenses of different countries to make recommendations for central government reforms.

3.3.7. Asset Tokenization: Technical Guidance Note[23]

This note suggests a path forward on the technical nuances to be considered during tokenization of assets, as well as how the standards around it could be formed. It also sets forward an approach that could be incorporated for any company or startup that wants to pursue the path of asset tokenization. This document could work as a ready reckoner for anyone who wants to tokenize any assets in the State of Telangana. It can serve as guidance for all the projects which are being built within the region and can enable them to get a suggestive pathway. This report also intends to provide guidance to other government agencies that want to look into tokenization.

3.3.8. Corporate Initiatives in Blockchain by Fostering Innovation and Building

Partnerships
The Telangana IT Department has forged partnerships with Tech Mahindra, ISB, HYD DAO, Polygon, Devfolio, Ryze Labs, IBC Media, BITFURY, nagarro, InnoHat Systems, Lukka, Algorand Foundation, ChitMonks, SEQUOIA, Woodstock, European Crypto Initiative, World Economic Forum, International Financial Services Centres Authority (IFSCA), Coinbase, Evident, dygnify, TRST01, Casper, Avalanche, Bharat Web3 Association, and Indian Blockchain.

Innovation
Ripple's University Blockchain Research Initiative (UBRI) has established a partnership with IIIT Hyderabad to conduct in-depth research on blockchain technology and its practical applications. Bitfury and the Indian School of Business (ISB) have also joined forces to advance blockchain education and research in India, aiming to cultivate a skilled workforce and drive innovation in the blockchain industry.

3.3.9. Web3 Community in Telangana: A Hub of Innovation and Collaboration

Telangana has firmly established itself as a leading hub for Web3 innovation in India, driven by groundbreaking events and the initiatives and Collaborations. The state gained international recognition by hosting the **International Blockchain Congress** in 2018, a platform that brought together global industry leaders. To further its mission, Telangana launched the B**lockchain Capacity Building Program**, aimed at educating students and faculty on blockchain fundamentals. Additionally, the **ETHforAll Hackathon** provided an experimental playground for young innovators to explore blockchain and Web3 technologies.

- **Hyderabad DAO: Building the Web3 Ecosystem:** As the most active Web3 developer community in Telangana, Hyderabad DAO has been instrumental in nurturing talent and fostering collaboration with over 2,000 members. The DAO organizes a variety of activities, including monthly blockchain meetups, university sessions, Faculty Development Programs (FDPs) to train educators in blockchain technology and curriculum development, and hands-on blockchain bootcamps that guide participants from foundational knowledge to deploying decentralized applications (DApps)

- **Representation at Global Web3 Conferences:** Hyderabad DAO has showcased Telangana's blockchain initiatives on prominent international platforms, including DevCon (Ethereum Foundation), ETH India, ETH Bangkok, India Blockchain Week (IBW), Token 2049 Singapore, and the Google Cloud Web3 Conclave. These engagements have solidified Hyderabad DAO's reputation as a significant contributor to the global blockchain ecosystem.

- **A Track Record of Success:** Over the past 2.5 years, Hyderabad DAO has hosted **50+ events** in collaboration with **30+ global blockchain companies and protocols**, solidifying its position as India's most active Web3 community. Its mission is clear: to establish Hyderabad as the **Web3 Capital of India**, leveraging the city's renowned technological capabilities and innovative spirit.

- **Global Partnerships**
  Hyderabad DAO has established prominent partnerships including: Aleph Zero, Arweave, Binance, Cosmos, Cardano, Polygon, Shardeum, Polkadot, StarkNet, Reef Chain, Nervos, Algorand, TON, Aurora, Filecoin, StackOS, LBank, OmniFlix, dYdX, Hypersign, Hyperlane, Timechain Labs, Router Protocol, Graviton, Concordium, CoinDCX, Farcaster, Huddle, etc. These collaborations aim to create greater opportunities for local developers and innovators, ensuring Telangana remains at the forefront of the Web3 revolution.

4. INDUSTRY-LED BLOCKCHAIN USE CASES IN INDIA

Industry-led blockchain use cases in India showcase how sectors like finance, healthcare, supply chain, and governance are leveraging blockchain technology to enhance transparency, efficiency, and trust in operations.

4.1. Tokenization

One of the biggest players in the ecosystem, Polygon is driving innovation in cross-border payments with real-time settlement through stablecoins. It has also enabled Flipkart to tokenize and list vouchers on a marketplace, contributing to the growth of e-commerce. Additionally, it is advancing real estate fractionalization through tokenization via the REET mechanism, allowing properties to be converted into equity. In the gold sector, it is enabling gold tokenization and blockchain-based borrowing solutions

4.2. Authenticity and Transparency

4.2.1. Astrix

This solution is utilizing blockchain technology to introduce authentication and transparency into ticketing in the live event industry. This platform represents a significant shift from traditional ticketing systems by introducing a fraud-proof, blockchain-based solution that provides real-time updates and an enriched event experience.

Transforming the Ticketing Experience

- **Fraud-Proof System:** The inherent decentralization and cryptographic security of blockchain enables Astrix to offer a ticketing solution that is virtually immune to fraud. Each ticket issued is a unique, NFT that can be traced and verified on the blockchain, ensuring that counterfeit tickets are virtually nonexistent.
- **Real-Time Updates:** Astrix leverages the blockchain to provide instant updates across the network. Ticket buyers and sellers can receive immediate confirmation of transactions, changes in event details, or any updates directly related to their purchased events. This level of responsiveness enhances customer satisfaction and streamlines event management.

- **Secondary Marketplace and B2B Discovery Platform:** In addition to primary ticket sales, Astrix enables a secondary marketplace that will allow ticket holders to resell their tickets while providing artists and/or event organizers the ability to cap the price charged on that secondary sale. Furthermore, a B2B discovery platform is being developed to connect event organizers with service providers, thereby enriching the event planning ecosystem and creating more value for all stakeholders.
- **Enhanced Event Experience:** The Astrix platform further enhances the overall event experience by integrating digital collectibles, exclusive content, and interactive engagement opportunities directly linked to the event.

Through these innovations, Astrix is setting a new standard for how events are ticketed, attended, and experienced. Astrix is using blockchain not only to ensure authentic and secure ticket sales, but also to enhance the connectivity and interactivity of the live event industry.

4.2.2. LW3

From verifying the origin of Assamese Tea to the reverse tracking of EV batteries, LW3 is utilizing blockchain technology to revolutionize product tracking and traceability through several key mechanisms:

- **Smart Contracts Automation:** LW3 utilizes smart contracts to automate and enforce compliance with sustainable practices and quality standards at each step of the supply chain. This automation not only speeds up transactions but also ensures they are completed without errors and in accordance with predefined rules.
- **Traceability:** LW3 introduces its 'Phygital Product Passport,' a digital certificate that tracks each product from its origin to the consumer. The passport records detailed information – such as the date of harvest or the initial purchase all the way to your kitchen table or to the drop off for recycling – on the blockchain, providing a tamper-proof and accessible log that can be crucial for regulatory compliance, consumer trust, and operational auditing.
- **Embedded Finance:** LW3 is integrating embedded finance into its platform, allowing for instant financial transactions that can support refunds, deposits, or pay-outs to different stakeholders in the supply chain.

LW3's blockchain solution in logistics exemplifies how technology can be leveraged to empower both consumers and producers. This approach not only can authenticate the origin and journey of a product, but also aligns with global sustainability goals by ensuring that materials like batteries are responsibly recycled and reused, reducing environmental impact and promoting resource efficiency.

4.2.3. Women Development & Child Welfare (WDCW)

Avalanche partnered with the Telangana government to develop a blockchain-based solution for the WDCW department. This initiative ensures the transparent and trustworthy delivery of direct benefits to individuals in need.

4.3. Digital Identity

Digital identity solutions powered by blockchain technology are particularly crucial in India, where proving identity can be a significant barrier to accessing essential services for low-income populations. Blockchain offers a secure, decentralized, and tamper-proof platform for

digital identities, facilitating greater inclusivity and access to services. Initiatives that illustrate the application of blockchain in digital identity solutions in India include the SEWA Digital Health Passport and the Mann Deshi Credit Scorecard solution.

Both the SEWA and Mann Deshi initiatives described below showcase the power of blockchain-based digital identity solutions to transform access to healthcare and financial services. These solutions promote inclusion while empowering individuals with ownership and control over their personal data. This approach is particularly effective in bridging the gap for those who have traditionally been underserved by conventional systems, driving forward socio-economic empowerment and equity.

4.3.1. SEWA Digital Health Passport for Healthcare Identity

Lok Swasthya Self-Employed Women's Association (SEWA) recently launched the Digital Health Passport, a blockchain solution designed to improve health access by providing a secure and immutable record of verified credentials, on the Algorand blockchain protocol. The digital passport enables SEWA members and their households to more efficiently enroll in critical health benefits and social safety net programs to provide secure, paperless, and cashless service delivery. This platform ensures that women, especially those from marginalized communities, have secure and easy access to their health records, enabling:

- **Secure Storage and Access:** Individual and household data is stored securely on the blockchain, providing women with control over who can access their information and when.
- **Efficient Health Service Delivery:** With access to their verified documents and personal data, women can more efficiently enroll in critical health and other safety net programs.
- **Enhanced Privacy and Compliance:** The solution adheres to strict data privacy standards, ensuring that personal health information is managed in compliance with national regulations.
- **Economic Empowerment:** The solution not only improves healthcare access but also fosters economic empowerment and self-reliance among women. This is a core goal of India Stack, which seeks to empower all Indians by providing them with tools to access various services seamlessly.

4.3.2. Mann Deshi Credit Scorecard Solution

The **Mann Deshi Foundation** is leveraging blockchain to offer digital identity solutions aimed at financial inclusion. This initiative focuses on providing women entrepreneurs and small business owners in rural areas with digital identities that facilitate access to banking and financial services:

- **Facilitating Financial Transactions:** With a secure digital identity on the blockchain, women can easily open bank accounts, apply for loans, and access other financial services that were previously out of reach due to lack of formal identification.
- **Building Credit Histories:** The blockchain platform allows for the recording of financial history as well as educational and professional experience, helping women build a credit history that can improve their eligibility for future borrowing from other banking institutions.
- **Targeted Programming:** With enhanced information on their clientele, including on their work and educational history, Mann Deshi Foundation will be able to better target training resources to increase financial literacy and borrowing success.

4.3.3. Senior Citizen Identity Verification System

Avalanche, in partnership with the Karnataka government, is developing a proof-of-concept (PoC) for a senior citizen identity verification system on the Avalanche blockchain. This solution aims to streamline age verification and facilitate direct access to government benefits.

4.4. Supply Chain Management

Blockchain technology is revolutionizing supply chain management, from manufacturing to cross border shipment. Companies like ARVO, Autom Axis, and Anveshak are at the forefront of deploying blockchain solutions that address various challenges within the supply chain, from quality control in manufacturing to inefficiencies in documentation processes.

4.4.1. ARVO: Enhancing Traceability and Authenticity

ARVO specializes in providing traceability and authenticity solutions for sectors heavily reliant on supply chain integrity, such as automotive and pharmaceutical industries. Utilizing a combination of artificial intelligence (AI), internet of things (IoT), and blockchain technology, ARVO ensures that products are genuine and traceable throughout their lifecycle. This includes:

- **Real-time Tracking:** Leveraging IoT devices, ARVO provides real-time data on the location and condition of products as they move through the supply chain.
- **Authentication at Every Step:** Using AI, ARVO analyzes patterns and anomalies to detect potential counterfeiting at various stages of the supply chain.
- **Immutable Records:** Blockchain technology records every transaction and movement, creating a tamper-proof ledger that all parties in the supply chain can trust.

4.4.2. Autom Axis: Revolutionizing Trade Documentation

Autom Axis contributes to supply chain efficiency with its FDP Connect solution, which digitizes the bill of lading. This crucial document underpins many global trade operations that have traditionally been prone to inefficiencies and fraud risks when handled in paper form. FDP Connect offers:

- **Digital Efficiency:** The Autom Axis digital format bill of lading document eliminates delays, lost documents, and entry errors associated with paper processing.
- **Enhanced Security:** Blockchain integration ensures that each digital bill of lading is secure and verifiable, reducing the risk of fraud and unauthorized alterations.
- **Global Accessibility:** Stakeholders from any part of the world can access and verify the authenticity of the bill of lading in real-time.

4.4.3. Anveshak: Advancing Traceability in Biofuels and Green Hydrogen

Anveshak introduces a novel application of blockchain technology using a mass balance model to trace sustainable energy sources such as biofuels and green hydrogen. This approach is critical for industries transitioning towards green energy solutions, which require rigorous documentation of the origin and lifecycle impacts of these energy sources. Anveshak's solution provides:

- **Accurate Sustainability Tracking:** Ensures that claims regarding the sustainability of biofuels or green hydrogen are verifiable and based on accurate, real-time data.
- **Mass Balance Traceability:** Utilizes a mass balance approach to track the input and output of sustainable materials throughout the supply chain, ensuring that the environmental impact is accurately recorded and reported.
- **Regulatory Compliance:** Helps companies comply with stringent regulations governing renewable energy credits and carbon emissions.

These companies are setting new standards in supply chain management, leveraging blockchain's inherent capabilities to enhance transparency, security, and efficiency. Their innovations not only solve existing challenges but also pave the way for more sustainable and ethical business practices across industries.

4.4. Microfinance and Inclusion

Blockchain technology is helping make significant strides in microfinance and financial inclusion. **FilmFinance** and **Miniland** are two unique startups from India that highlight the diverse applications of blockchain in facilitating economic empowerment and access to financial services. Both initiatives showcase how blockchain is being utilized to enhance financial inclusion and microfinance opportunities. FilmFinance introduces a new way for individuals to participate in film financing, while Miniland provides innovative solutions for land ownership that can help bridge the wealth gap. These solutions not only foster economic empowerment but also ensure that financial systems are more inclusive, transparent, and efficient.

4.4.1. FilmFinance: Empowering Film Industry Stakeholders

FilmFinance leverages blockchain to transform how investments in the film industry are managed. This platform allows for the secure fractional tokenization of films and web series, enabling:

- **Democratization of Investment:** By offering fractional ownership through tokens, FilmFinance opens up investment opportunities in the entertainment sector to a broader audience.
- **Transparent and Secure Transactions:** The transparent and secure nature of transactions recorded on blockchain provide investors with confidence in the integrity of their investments.
- **Smart Contract Execution:** The use of smart contracts automates the distribution of profits and royalties, ensuring that investors receive their due returns efficiently and without dispute.

4.4.2. Miniland: Revolutionizing Land Ownership and Transactions

Miniland focuses on the tokenization of land, a revolutionary approach that enhances transparency and accessibility in real estate transactions. This platform provides:

- **Simplified Land Ownership Transfers:** Tokenization allows for the seamless transfer of land ownership without the cumbersome bureaucracy typically associated with real estate transactions.
- **Enhanced Access to Capital:** By tokenizing land, property owners can unlock the value of their assets more easily, accessing capital by selling fractional interests in the property.
- **Increased Market Efficiency:** The blockchain-based system reduces fraud, lowers transaction costs, and speeds up processes, making real estate markets more efficient and accessible.

4.5. Sustainability

4.5.1. Sow & Reap

It is pioneering climate tech and finance company based in Hyderabad, is making significant strides to support farmers and other rural residents in their adoption of sustainable technologies. Collaborating with scientists and technical partners, Sow & Reap is utilizing digital monitoring, reporting, and verification (dMRV) technologies to support carbon credit generating projects that span renewable energy and AFOLU (Agro-Forestry and Land Use). Blockchain helps provide immutable records and transparent reporting of dMRV data to generate higher value carbon credits that help incentivize practices with a proven record of mitigating climate change.

4.5.2. Terano

Based out of Delhi, Terano is at the cutting edge of environmental and financial technology, utilizing blockchain solutions to transform the management and trading of carbon credit assets. Key aspects of Terano's blockchain-based solution include:

- **Tokenization of Carbon Credits:** By converting carbon credits into digital tokens on a blockchain, Terano significantly enhances their liquidity, allowing for easier and faster trading, while also opening the market to a broader range of investors.
- **Reduced Costs:** The reduced need for intermediaries in a blockchain-based solution reduces transaction costs, making the carbon credit market more accessible and financially viable for more businesses.
- **Enhanced Risk Management:** With every transaction recorded on a secure, immutable ledger, blockchain reduces the risk of fraud while enabling more accurate tracking of carbon credit origins and ownership.
- **Comprehensive Carbon Management Tools:** Terano provides businesses with precise tools to measure, reduce, and report emissions. These tools help businesses not only comply with regulations but also optimize their carbon usage and reduce environmental impact strategically.

By tokenizing both traded and non-traded carbon credits, Terano aims to enhance the transparency and security of these assets while also improving their liquidity and management efficiency. This innovative approach enables businesses to turn their environmental responsibility into a profitable and strategically advantageous endeavor.

4.6. Securing the Blockchain Ecosystem

In the rapidly evolving blockchain ecosystem, security remains a paramount concern, especially with the increasing adoption of NFTs, digital financial assets, and decentralized applications (dApps). **SecureDapp** and **David's Protocol** are at the forefront of addressing these security challenges.

Together, SecureDapp and David's Protocol provide comprehensive security solutions that address both the operational and financial risks within the blockchain ecosystem. These efforts are crucial for the continued growth and maturation of blockchain technologies, making the ecosystem more secure and appealing to a broader audience.

4.6.1. SecureDapp

This solution is dedicated to strengthening the security framework around decentralized applications by focusing on:

- **Preventive Security Measures:** SecureDapp implements advanced security protocols to safeguard dApps from vulnerabilities from their development phase through to their operational stage.
- **Comprehensive Protection:** The company offers a suite of security tools designed to detect and mitigate potential threats in real-time, ensuring the integrity and reliability of dApps.
- **Building Trust:** By securing dApps against a wide array of cyber risks, SecureDapp plays a critical role in building trust among users and developers, which is essential for the widespread adoption of decentralized technologies.
- **Community and Developer Support:** SecureDapp provides ongoing support and resources to the developer community, empowering them with the knowledge and tools needed to create secure applications.

4.6.2. David's Protocol

It addresses the financial risk aspects of blockchain investments, particularly in the realm of NFTs and digital financial assets. It offers tailored insurance solutions to mitigate risks associated with these investments, enhancing investor confidence through:

- **Tailored Insurance Coverage:** David's Protocol provides specialized insurance products that protect against losses from fraud, theft, and other specific perils that threaten digital assets.
- **Risk Management:** The protocol employs a strategic approach to risk assessment, helping investors understand potential vulnerabilities and how best to protect against them.
- **Enhancing Market Stability:** By offering insurance, David's Protocol contributes to the overall stability of the digital asset market, encouraging more secure and responsible investment practices.
- **Investor Education and Support:** David's Protocol also focuses on educating investors about the importance of insurance in managing risks associated with blockchain investments, offering detailed consultations and support for those looking to secure their digital assets.

4.7. Trading

Avalanche supports impactful Web2 and Web3 projects through grants, investments, and innovation, fostering entrepreneurship and aiding Web2 companies in transitioning to Web3 on Avalanche. Some of their support initiatives include

4.7.1. Growfitter

This solution offers an incentivized wellness platform designed to motivate users to adopt an active and healthy lifestyle. With over 2 million app users, it provides a gamified solution for trading digital assets, tokens, brand NFTs, and real-world assets (RWA) on the Avalanche blockchain. Growfitter has partnered with 100+ premium brands, including Puma, Jockey, Gillette, Sandbox, and more, to deliver engaging and rewarding experiences. By incorporating unique NFT games, a ticketed raffle system, and fitness challenges, Growfitter makes digital asset trading both accessible and enjoyable. The platform anticipates achieving 128,000 daily active users (DAUs), further strengthening its position as a leading wellness and blockchain solution.

4.7.2. TradeX

This solution is an innovative online trading platform that allows users to invest or trade based on predictions about real-world events. Users can speculate on outcomes in areas such as politics, economics, and weather, leveraging their opinions to influence trading decisions. Positioned in the B2C FinTech, Media, and Entertainment segments, TradeX also offers a Loyalty Program that enables users to earn additional rewards. With a goal to onboard 2 million users across India and the APAC region, TradeX is poised to revolutionize event-based trading and user engagement.

4.8. Certifications

4.8.1. IEEE – Certificate Issuance

In collaboration with IEEE, Avalanche has implemented a solution for issuing and verifying certificates on the Avalanche blockchain. This system provides tamper-proof and verifiable credentials for individuals who complete courses with the organization.

4.8.2. Digital Public Goods (DPG)

Avalanche is working with a United Nations agency to integrate Digital Public Goods (DPG) on blockchain. This initiative enables users to receive blockchain-based certificates for completed tasks, which can then be presented to governments for direct benefits like employment or subsidies

4.9. Education and Skilling

Avalanche India is actively promoting blockchain awareness and community building through meetups, workshops, and events across India, including Tier-1 cities like New Delhi and Bangalore, as well as Tier-2 cities like Indore. Its workshops and hackathons at top universities such as IITs and Centurion University of Technology and Management (CUTM) to educate students on blockchain development, attracting over 300 registrations and 250+ in-person attendees on average. Additionally, Avalanche hosted a community game launch in Delhi, showcasing “Off The Grid,” a high-graphics, blockchain-based AAA game, highlighting the transformative potential of Avalanche-powered technology in gaming.

Polygon’s Web3 Made in India tour is set to engage developers, entrepreneurs, and students across India through seven Guild events and campus collaborations with experiential learning platform Reskill. Polygon aims to deliver hands-on blockchain education to students at 50 colleges, with cohorts of 50-100, culminating in micro-hackathons to showcase their dApps. Additionally, Polygon is partnering with Pesto Tech to help Web2 developers transition to Web3, aiming to build a network of skilled developers for future blockchain innovation

4.10. Bharat Web3 Association (BWA)

India is on the brink of a digital transformation, with the Web3 revolution poised to reshape the nation's economy, governance, and society. With its decentralized, transparent, and user-focused approach, Web3 is unlocking unparalleled opportunities for growth, inclusivity, and empowerment. Our latest report, the Web3 Compendium, highlights over 400 Web3 firms, showcasing the dynamic entrepreneurial spirit and innovation of Indian pioneers. From decentralized finance (DeFi) and blockchain infrastructure to NFTs, the Metaverse, decentralized autonomous organizations (DAOs), and custody wallets, Indian companies are leading the way in leveraging Web3 technologies to create transformative applications and services - Dilip Chenoy, Chairman, BWA

The Bharat Web3 Association (BWA) is an industry body representing leading members of India's Web3 ecosystem. Its members include prominent infrastructure providers such as Polygon; Virtual Digital Assets (VDA) exchanges like CoinDCX, Coinbase, and CoinSwitch; gaming platforms such as Hike; and other Web3 innovators like Liminal and KoinX.

BWA is committed to strengthening India's Web3 ecosystem by raising awareness, conducting research, establishing industry standards, and fostering indigenous talent. Aligned with initiatives like Atma Nirbhar Bharat, Start-Up India, and Digital India, it emphasizes the transformative potential of Web3 to contribute significantly to India's economy and technological progress. Through its internal subcommittees, BWA formulates focused strategies in areas such as policy, compliance, and partnerships to drive innovation and ensure a structured approach to Web3 adoption.

Key partnerships include working with the Government of Telangana on Web3 regulatory sandbox, collaborating with Maharashtra on State Skills University, and engaging with global entities like Blockchain Australia, Blockchain Association Singapore and the European Crypto Initiative. It engages with regulators and industry players to create comprehensive reports and foster a conducive environment for Web3 growth. This includes Consumer Protection Guidelines, AML Compliance under PMLA regulations, and the recently released Web3 Compendium, with more than 400 Web3 based firms operating in India recorded. Articles by BWA leaders and members have been published in various publications, including Economic Times, Business World, and Financial Express.

5. CHALLENGES IN BLOCKCHAIN ADOPTION

5.1. Technical Challenges: Scalability, Security, and Integration

India's blockchain journey faces hurdles in scalability, security, and integration. The technology's inherent limitations in processing high transaction volumes and maintaining privacy need to be addressed. Ensuring data security and preventing vulnerabilities is crucial. Seamless integration with existing systems, interoperability requirements such as standardizing data formats, protocols, and APIs, along with rigorous testing, is also essential for broader adoption.

5.2. Navigating Compliance Challenges

India's current regulatory landscape presents significant challenges for startups operating in the emerging technology sectors. The absence of clear and comprehensive frameworks in several areas is hindering innovation and driving businesses to seek more favorable jurisdictions. Some are mentioned below:

- Financial Services and Cryptocurrencies: A comprehensive regulatory framework for digital lending, clear cryptocurrency regulations, and streamlined AML (Anti-Money Laundering) processes are essential for India's fintech ecosystem. Startups face increased compliance costs due to stringent AML regulations, leading to higher operational expenses and reduced profit margins.

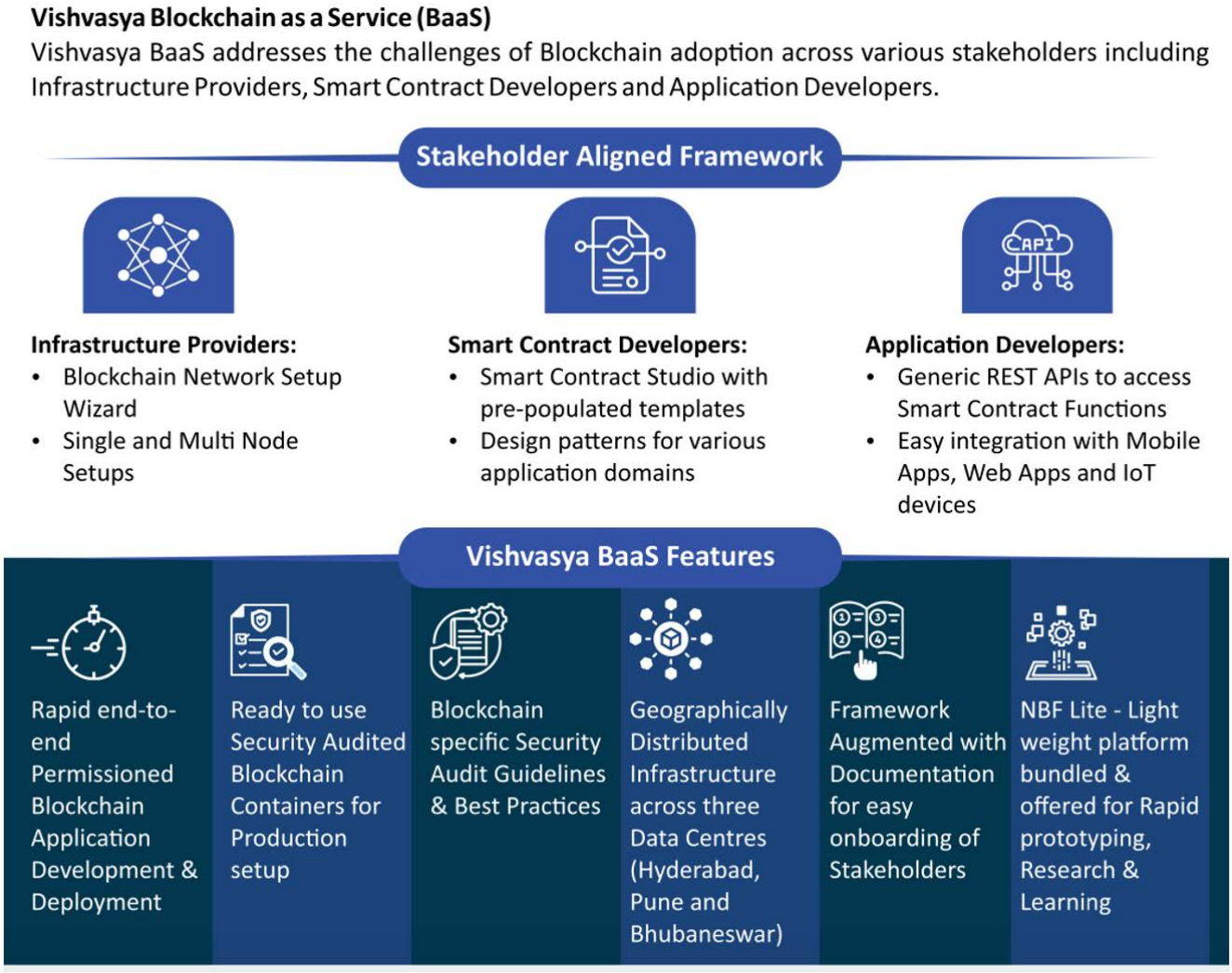
- India requires standardized carbon credit verification (Environment, Social & Governance) to promote sustainable business practices for carbon offset blockchain projects and attract green investments. Robust risk management frameworks and clear regulations on electronic signatures are needed to support business growth and operations in India.

5.3. Market Adoption Barriers: Awareness, Trust, and Education

Widespread adoption of blockchain in India is hindered by factors such as low awareness, trust issues, and inadequate education. Many people are unfamiliar with the technology and its benefits. Building trust in decentralized systems is essential. Moreover, there's a need for comprehensive education and training programs to equip individuals and organizations with the necessary knowledge and skills.

6. APPENDIX

Vishvasya: National Blockchain Technology Stack - Enabling trust in digital systems



Full details here: https://static.pib.gov.in/WriteReadData/specificdocs/documents/2024/sep/doc202494387501.pdf

SOURCES:

1. https://www.business-standard.com/markets/cryptocurrency/india-has-over-19-million-crypto-investors-with-75-youth-report-123122200814_1.html, https://economictimes.indiatimes.com/tech/technology/indian-web3-industry-to-reach-1-1-billion-by-2032-report/articleshow/98632635.cms?from=mdr
2. https://www.statista.com/outlook/dmo/fintech/digital-assets/india
3. https://tracxn.com/d/explore/blockchain-in-financial-services-startups-in-india/__RaWEWQGswGy0BjCoE4i4pXwnHxjnwRwm42Zpug4d-os/companies
4. https://community.nasscom.in/communities/blockchain/web-30-investor-market-india-calling#:~:text=In%202021%2C%20international%20funds%20invested,to%20data%20shared%20by%20Tracxn

5. https://it.telangana.gov.in/wp-content/uploads/2022/12/Telangana-Blockchain-Framework.pdf
6. https://www.expresscomputer.in/news/the-1st-international-blockchain-congress-creates-the-largest-blockchain-event-in-asia/27605/
7. https://education.economictimes.indiatimes.com/news/bimtech-and-kalp-decentra-foundation-announce-strategic-collaboration-to-establish-blockchain-learning-centre/112643092, https://ciso.economictimes.indiatimes.com/news/iits-prepare-for-web-3-0-future-to-offer-crypto-blockchain-nft-courses/94143882
8. https://www.pwc.in/consulting/technology/emerging-tech/blockchain-lab.html
9. National Strategy on Blockchain, MeitY, 2021: https://www.meity.gov.in/writereaddata/files/National_BCT_Strategy.pdf
10. National Blockchain Framework Brochure, MeitY, https://static.pib.gov.in/WriteReadData/specificdocs/documents/2024/sep/doc202494387501.pdf, Press Information Bureau; C-DAC, https://pib.gov.in/PressReleasePage.aspx?PRID=2051934
11. PIB launch 2022 - https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1882883
12. RBI's currency and finance report: https://rbidocs.rbi.org.in/rdocs/Publications/PDFs/RCF29072024D5F1960668724737AD152F783DB63F10.PDF
13. Forbes India: https://www.nic.in/emergings/centre-of-excellence-for-blockchain-technology/
14. Livemint https://www.livemint.com/money/personal-finance/what-g20-decided-on-crypto-and-foreign-assets-11694453267825.html
15. https://www.india-briefing.com/news/cryptocurrencies-in-india-to-be-subject-to-anti-money-laundering-aml-compliance-27354.html/
16. https://tnega.tn.gov.in/page/36
17. https://landrecords.karnataka.gov.in/Service2/
18. https://igr.karnataka.gov.in/new-page/Block%20Chain/en
19. https://www.deccanherald.com/india/karnataka/karnataka-to-use-blockchain-for-property-registration-934862.html, https://mahabhumi.gov.in/
20. https://indianexpress.com/article/cities/mumbai/maharashtra-to-protect-property-e-registration-agreements-with-blockchain-technology-8135241/https://agri.punjab.gov.in/
21. https://agriwelfare.gov.in/Documents/DPR_Punjab.pdf
22. https://www.magzter.com/stories/Computer-Mobile/Express-Computer/Rajasthan-Leads-Indias-First-Government-Blockchain-Implementation?srsltid=AfmBOop6OlWsyWYmnTa5ZgBf9758GBT9haE03PDBfa6zi7NzFhVwHrjA
23. https://invest.up.gov.in/wp-content/uploads/2023/10/Uttar-Pradesh-Government_091023.pdf, https://web3sandbox.telangana.gov.in/

ENDNOTES

1 CoinSwitch, https://www.business-standard.com/markets/cryptocurrency/india-has-over-19-million-crypto-investors-with-75-youth-report-123122200814_1.html, https://economictimes.indiatimes.com/tech/technology/indian-web3-industry-to-reach-1-1-billion-by-2032-report/articleshow/98632635.cms?from=mdr, Statista - https://www.statista.com/outlook/dmo/fintech/digital-assets/india, Tracxn - https://tracxn.com/d/explore/blockchain-in-financial-services-startups-in-india/__RaWEWQGswGy0BjCoE4i4pXwnHxjnwRwm42Zpug4d-os/companies, https://community.nasscom.in/communities/blockchain/web-30-investor-market-india-calling#:~:text=In%202021%2C%20international%20funds%20invested,to%20data%20shared%20by%20Tracxn

2 https://it.telangana.gov.in/wp-content/uploads/2022/12/Telangana-Blockchain-Framework.pdf https://www.expresscomputer.in/news/the-1st-international-blockchain-congress-creates-the-largest-blockchain-event-in-asia/27605/ https://education.economictimes.indiatimes.com/news/bimtech-and-kalp-decentra-foundation-announce-strategic-collaboration-to-establish-blockchain-learning-centre/112643092, https://ciso.economictimes.indiatimes.com/news/iits-prepare-for-web-3-0-future-to-offer-crypto-blockchain-nft-courses/94143882

3 https://www.pwc.in/consulting/technology/emerging-tech/blockchain-lab.html

4 National Strategy on Blockchain, MeitY, 2021: https://www.meity.gov.in/writereaddata/files/National_BCT_Strategy.pdf

5 *National Blockchain Framework Brochure, MeitY, Press Information Bureau; C-DAC*

6 *National Blockchain Framework Brochure, MeitY, Press Information Bureau; C-DAC*

7 *National Blockchain Framework Brochure, MeitY, Press Information Bureau; C-DAC*

8 *National Blockchain Framework Brochure, MeitY, Press Information Bureau; C-DAC*

9 *National Blockchain Framework Brochure, MeitY, Press Information Bureau; C-DAC*

10 PIB launch 2022 - https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1882883

RBI's currency and finance report https://rbidocs.rbi.org.in/rdocs/Publications/PDFs/RCF29072024D5F1960668724737AD152F783DB63F10.PDF

11 *National Strategy on Blockchain, MeitY, 2021, Forbes India https://www.nic.in/emergings/centre-of-excellence-for-blockchain-technology/*

12 *Livemint*

13 https://economictimes.indiatimes.com/industry/telecom/telecom-news/trai-pushes-meity-to-act-strongly-to-curb-spam-phishing-on-ott-apps/articleshow/113104092.cms?from=mdr

14 https://www.india-briefing.com/news/cryptocurrencies-in-india-to-be-subject-to-anti-money-laundering-aml-compliance-27354.html/

15 *National Blockchain Framework Brochure, MeitY, Press Information Bureau; C-DAC*

16 https://tnega.tn.gov.in/page/36

17 https://landrecords.karnataka.gov.in/Service2/, https://igr.karnataka.gov.in/new-page/Block%20Chain/en, https://www.deccanherald.com/india/karnataka/karnataka-to-use-blockchain-for-property-registration-934862.html

18 https://mahabhumi.gov.in/, https://indianexpress.com/article/cities/mumbai/maharashtra-to-protect-property-e-registration-agreements-with-blockchain-technology-8135241/

19 https://agri.punjab.gov.in/, https://agriwelfare.gov.in/Documents/DPR_Punjab.pdf

20 https://www.magzter.com/stories/Computer-Mobile/Express-Computer/Rajasthan-Leads-Indias-First-Government-Blockchain-Implementation?srsltid=AfmBOop6OlWsyWYmnTa5ZgBf9758GBT9haE03PDBfa6zi7NzFhVwHrjA, https://invest.up.gov.in/wp-content/uploads/2023/10/Uttar-Pradesh-Government_091023.pdf

21 https://web3sandbox.telangana.gov.in/
22 https://web3sandbox.telangana.gov.in/
23 https://it.telangana.gov.in/wp-content/uploads/2023/12/Technical-Guidance-Note-on-Asset-Tokenization.pdf

GLOBAL BLOCKCHAIN BUSINESS COUNCIL

DC Location:
1629 K St. NW, Suite 300
Washington, DC 20006

Geneva Location:
Rue de Lyon 42B
1203 Geneva
Switzerland